

Determining *Normal and Abnormal* using Deep Learning

John Hebeler, PhD
Lockheed Martin Fellow
john.w.hebeler@lmco.com

Is that Normal?



WHY?

*Actually, it is a pursuit
of **Abnormal!***



Decomposing (Ab)Normal

1.State and Context

- e.g. Valid State in Wrong Context

2.Relationships

- Time/Sequence
- Associations
- Hierarchy

3.Evolution vs. Abnormal

- Thresholds
- Dynamics
- Outliers



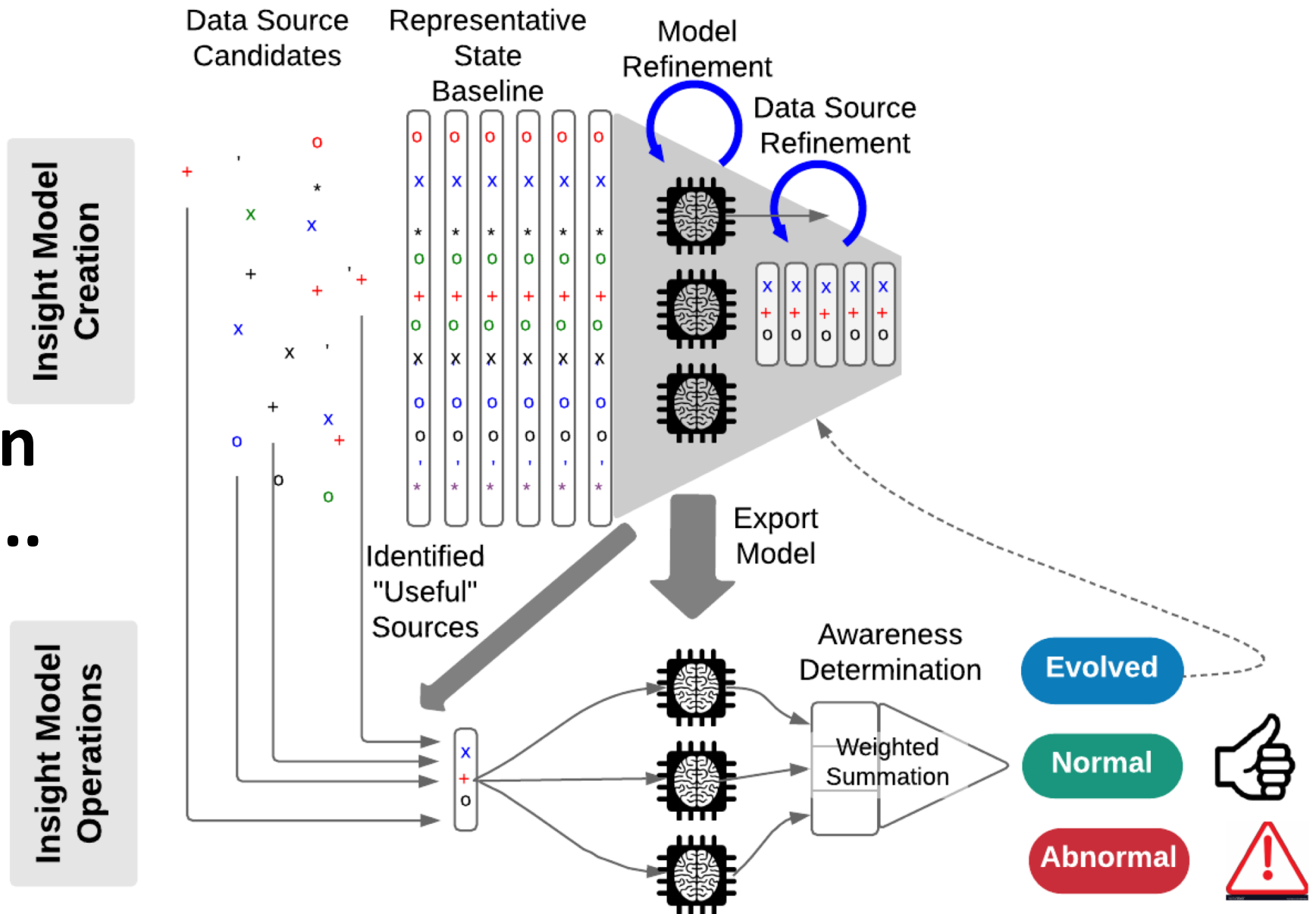


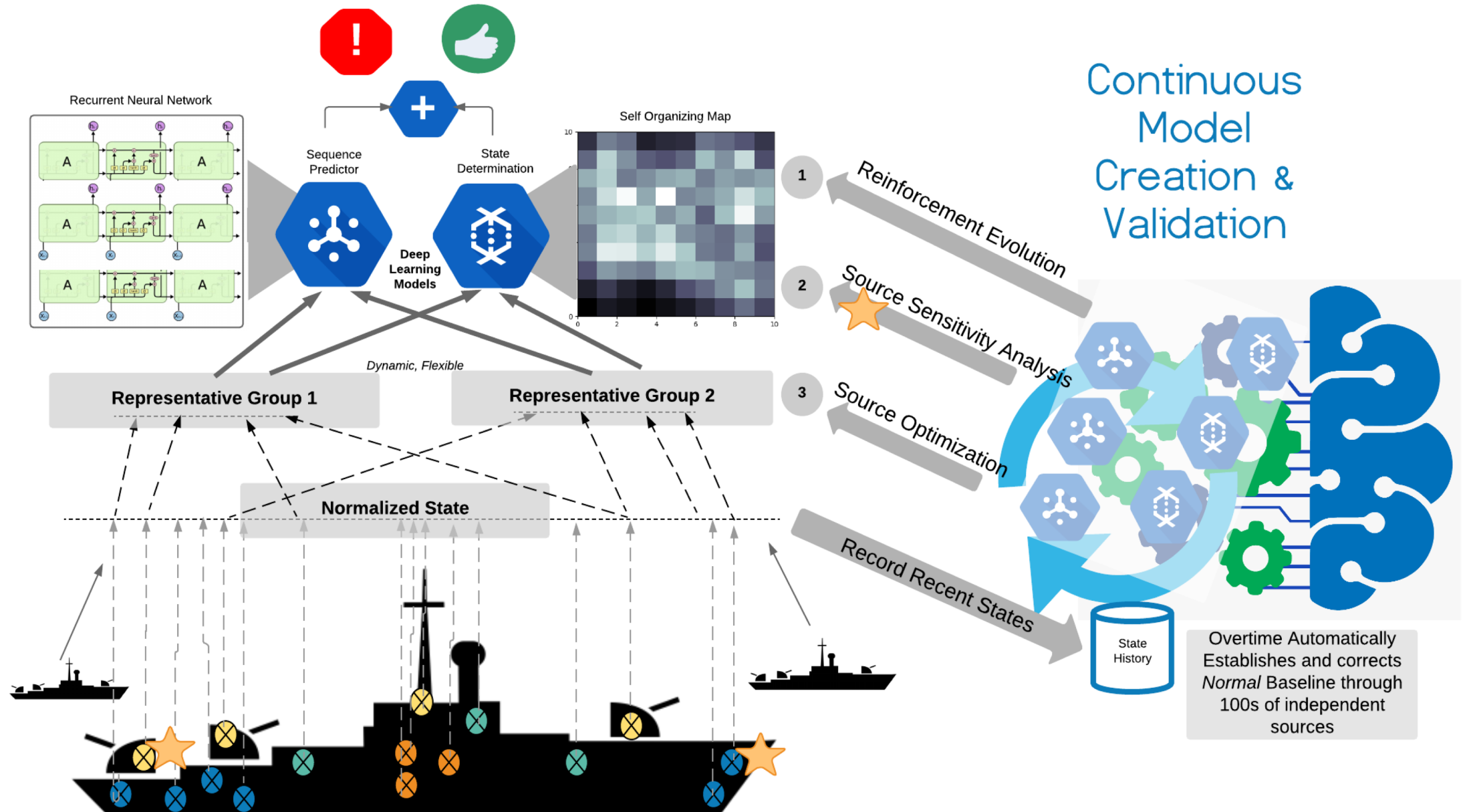


Finding Normal...



Model Creation and Evolution...





Summary

- Finding *Ab/Normal*
 - Challenging!
 - Rarity makes it more so...
- Deep Learning provides flexible insights
 - Multiple methods sharpen focus
 - Capable of adaptation/evolution
- Applicable to many domains
- Allows multiple levels of resolution
- More possibilities (data, methods, ...) to **explore** ...





Thank You!

John Hebeler, PhD
john.w.hebeler@lmco.com